Claims

1. A process for the production of a synthetic low sulphur diesel fuel and a low soot emission aviation fuel from a Low Temperature Fischer-Tropsch (LTFT) feedstock, said process including the fractionation of the Low Temperature Fischer-Tropsch feedstock into a light kerosene fraction and a heavier diesel fraction in a volumetric ratio of between 1:2 and 5:4 to form the light kerosene fraction useable as a low soot emission aviation fuel and/or an aviation fuel blend stock, and the heavier diesel fraction useable as a synthetic low sulphur diesel fuel and/or a diesel fuel blend stock, said fractions substantially complying with diesel and aviation fuel specifications.

2. A process as claimed in claim 1, wherein at least 33 volume% of the LTFT feedstock is separated to form said aviation fuel or blending stock having a final boiling point of about 270°C.

3. A process as claimed in claim 1 or claim 2, wherein the process includes fractionation and removal of 45 volume%, or even 55 volume% of the feedstock to form said aviation fuel or blending stock.

4. A synthetic aviation fuel or fuel blend stock for a semi-synthetic aviation fuel, said aviation fuel or blend stock being produced by a process as claimed in any one of claims 1 to 3 and having the following properties:

- from 13 mass% to 17 mass% hydrogen;
- iso:n-paraffins mass ratio of 0.5 to 3;
- BOCLE lubricity wear scar less than 0.85mm; and
- oxygen as oxygenates less than 50 ppm, typically less than about 10 ppm; of which
    - oxygen as primary C7 – C12 alcohols is less than 50 ppm, typically less than about 10 ppm; and
    - oxygen as primary C12 – C24 alcohols is less than 50 ppm, typically less than about 10 ppm.

5. A synthetic aviation fuel or fuel blend stock as claimed in claim 4, having less than 0.1%m/m aromatics.

6. A synthetic aviation fuel or fuel blend stock as claimed in claim 4 or claim 5, having a smoke point greater than 50mm.

7. A synthetic aviation fuel or fuel blend stock as claimed in any one of claims 4 to 6, having a density@20°C about 0.75 kg/l.

8. A synthetic aviation fuel or fuel blend stock as claimed in any one of claims 4 to 7, having a freezing point of below -47°C;

9. A synthetic aviation fuel or a fuel blend stock as claimed in any one of claims 4 to 8, wherein the iso:n paraffins mass ratio is from 1 to 2.

10. A synthetic aviation fuel or a fuel blend stock as claimed in any one of claims 4 to 8, wherein the iso:n paraffins mass ratio is from 1.16 to 1.2.

11. A synthetic aviation fuel or a fuel blend stock as claimed in any one of claims 4 to 10, wherein the hydrogen is about 15 mass%.

12. A synthetic aviation fuel or a fuel blend stock as claimed in any one of claims 4 to 11 which is a LTFT kerosene fraction.

13. A synthetic aviation fuel or a fuel blend stock as claimed in any one of claims 4 to 12, wherein the blend stock has a viscosity@-20°C of less than 8cSt.

14. A synthetic aviation fuel or a fuel blend stock as claimed in any one of claims 4 to 13, which has a final boiling point of above 200°C, typically about 270°C.

15. A semi-synthetic aviation fuel including from 0.1 mass% to 99.9 mass% of a blending stock as claimed in any one of claims 4 to 14, said semi-synthetic aviation fuel having:

- iso:n-paraffins ratio of 0.5 to 3;
- Smoke point greater than 35mm; and
- at least 8%m/m aromatics.

16. A semi-synthetic aviation fuel as claimed in claim 15, having a density@15°C of at least 0.775 kg/l.

17. A semi-synthetic aviation fuel as claimed in claim 15 or claim 16, having a smoke point greater than 35mm.

18. A semi-synthetic aviation fuel as claimed in any one of claims 15 to 17, having a freezing point of below -47°C;

19. A semi-synthetic aviation fuel as claimed in any one of claims 15 to 18, having an iso:n paraffins mass ratio of from 1 to 2.

20. A semi-synthetic aviation fuel as claimed in claim 19, wherein the iso:n paraffins mass ratio is 1.8.

21. A semi-synthetic aviation fuel as claimed in any one of claims 15 to 20, including 50 vol% of the blending stock, wherein the blending stock is LTFT kerosene, and 50 volume% crude oil derived sweetened and severely hydrotreated kerosene.

22. A thermally stable aviation fuel with low deposition tendency when combusted, said fuel including one or more fuel selected from a synthetic aviation fuel, and a synthetic aviation fuel blend stock as claimed in any one of

claims 4 to 14, and a semi-synthetic aviation fuel as claimed in any one of claims 15 to 21, said thermally stable aviation fuel having a thermal stability tube deposit rating at 260°C of less than 1.

23. A thermally stable aviation fuel as claimed in claim 22, having Quartz Crystal Microbalance (QCM) deposition of less than 3 $\mu g/cm^2$.

24. A thermally stable aviation fuel as claimed in claim 22 or claim 23, having QCM deposition of less than 2 $\mu g/cm^2$ for a 15h QCM test @ 140°C without addition of an anti-oxidant.

25. A synthetic low sulphur fuel or blend stock for a low sulphur fuel produced by the process of any one of claims 1 to 3, said fuel or blend stock having the following properties:

- from 13 mass% to 17 mass% hydrogen;
- iso:n-paraffins mass ratio of from 2 to 5
- less than 0.1%m/m aromatics;
- CFPP according to IP309 of below -5°C;
- density@20°C of at least 0.780 kg/l; and
- total oxygen content less than 80 ppm.

26. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in claim 25, wherein the iso:n paraffins mass ratio is from 3 to 4.

27. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in claim 26, wherein the iso:n paraffins mass ratio is 3.7.

28. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in any one of claims 25 to 27, wherein the hydrogen is about 15 mass%.

29. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in any one of claims 25 to 28, wherein the CFPP is below -9°C.

30. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in any one of claims 25 to 29, wherein the fuel or blend stock is a LTFT diesel fraction.

31. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in any one of claims 25 to 30, which has a viscosity@40°C of above 2cSt.

32. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in any one of claims 25 to 31, which has a final boiling point of above 330°C.

33. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in any one of claims 25 to 32, which has an IBP of above 200°C.

34. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in any one of claims 25 to 33, which has an IBP above 250°C.

35. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in any one of claims 25 to 33, which has an IBP above 265°C.

36. A synthetic low sulphur fuel or blend stock for a low sulphur fuel as claimed in any one of claims 33 to 35, which when combusted in a compression ignition engine produces substantially an equivalent amount of particulate emissions as a European EN590 reference diesel fuel when combusted under the same conditions in the same engine.